

SEQUENCE LISTING

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<120> Sugar chain synthetase

<130> A21774A

<160> 30

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<211> 398

<212> PRT

<213> Mouse

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Ser Arg Leu Leu Met Glu Gly Ser Arg Glu Asp Thr Ser Gly Thr Ser

35 40 45

Ala Ala Leu Lys Thr Leu Trp Ser Pro Thr Thr Pro Val Pro Arg Thr

50 55 60

Arg Asn Ser Thr Tyr Leu Asp Glu Lys Thr Thr Gln Ile Thr Glu Lys

65 70 75 80

Cys Lys Asp Leu Gln Tyr Ser Leu Asn Ser Leu Ser Asn Lys Thr Arg

85 90 95

Arg Tyr Ser Glu Asp Asp Tyr Leu Gln Thr Ile Thr Asn Ile Gln Arg

100 105 110

Cys Pro Trp Asn Arg Gln Ala Glu Glu Tyr Asp Asn Phe Arg Ala Lys

115 120 125

Leu Ala Ser Cys Cys Asp Ala Ile Gln Asp Phe Val Val Ser Gln Asn

130 135 140

Asn Thr Pro Val Gly Thr Asn Met Ser Tyr Glu Val Glu Ser Lys Lys

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| 145 | 150 | 155 | 160 |
| His Ile Pro Ile Arg Glu Asn Ile Phe His Met Phe Pro Val Ser Gln | | | |
| 165 | 170 | 175 | |
| Pro Phe Val Asp Tyr Pro Tyr Asn Gln Cys Ala Val Val Gly Asn Gly | | | |
| 180 | 185 | 190 | |
| Gly Ile Leu Asn Lys Ser Leu Cys Gly Ala Glu Ile Asp Lys Ser Asp | | | |
| 195 | 200 | 205 | |
| Phe Val Phe Arg Cys Asn Leu Pro Pro Ile Thr Gly Ser Ala Ser Lys | | | |
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| Asp Val Gly Ser Lys Thr Asn Leu Val Thr Val Asn Pro Ser Ile Ile | | | |
| 225 | 230 | 235 | 240 |
| Thr Leu Lys Tyr Gln Asn Leu Lys Glu Lys Lys Ala Gln Phe Leu Glu | | | |
| 245 | 250 | 255 | |
| Asp Ile Ser Thr Tyr Gly Asp Ala Phe Leu Leu Leu Pro Ala Phe Ser | | | |
| 260 | 265 | 270 | |
| Tyr Arg Ala Asn Thr Gly Ile Ser Phe Lys Val Tyr Gln Thr Leu Lys | | | |
| 275 | 280 | 285 | |
| Glu Ser Lys Met Arg Gln Lys Val Leu Phe Phe His Pro Arg Tyr Leu | | | |
| 290 | 295 | 300 | |
| Arg His Leu Ala Leu Phe Trp Arg Thr Lys Gly Val Thr Ala Tyr Arg | | | |
| 305 | 310 | 315 | 320 |
| Leu Ser Thr Gly Leu Met Ile Ala Ser Val Ala Val Glu Leu Cys Glu | | | |
| 325 | 330 | 335 | |
| Asn Val Lys Leu Tyr Gly Phe Trp Pro Phe Ser Lys Thr Ile Glu Asp | | | |
| 340 | 345 | 350 | |
| Thr Pro Leu Ser His His Tyr Tyr Asp Asn Met Leu Pro Lys His Gly | | | |
| 355 | 360 | 365 | |

| | |
|---|---------|
| Phe His Gln Met Pro Lys Glu Tyr Ser Gln Met Leu Gln Leu His Met | |
| 370 | 375 380 |
| Arg Gly Ile Leu Lys Leu Gln Phe Ser Lys Cys Glu Thr Ala | |
| 385 | 390 395 |
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| Met Arg Ser Gly Gly Thr Leu Phe Ala Leu Ile | |
| 1 5 10 | |
| ggc agc ctg atg ctg ctg ctc ctc ctg cgt atg ctc tgg tgc cca gcc | 157 |
| Gly Ser Leu Met Leu Leu Leu Leu Leu Arg Met Leu Trp Cys Pro Ala | |
| 15 20 25 | |
| gac gcg cct gcc cgc tcc agg ctg ttg atg gag gga agc aga gag gac | 205 |
| Asp Ala Pro Ala Arg Ser Arg Leu Leu Met Glu Gly Ser Arg Glu Asp | |
| 30 35 40 | |
| acc agt ggt acc tca gct gca ctg aag aca ctc tgg agc ccg aca acc | 253 |
| Thr Ser Gly Thr Ser Ala Ala Leu Lys Thr Leu Trp Ser Pro Thr Thr | |
| 45 50 55 | |
| ccg gta cca cgc acc agg aac agc aca tat ctg gat gag aag aca acc | 301 |
| Pro Val Pro Arg Thr Arg Asn Ser Thr Tyr Leu Asp Glu Lys Thr Thr | |
| 60 65 70 75 | |
| caa ata aca gag aaa tgc aaa gat ctg caa tat agc ttg aac tct tta | 349 |
| Gln Ile Thr Glu Lys Cys Lys Asp Leu Gln Tyr Ser Leu Asn Ser Leu | |
| 80 85 90 | |

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|---|-----|
| tct aac aaa acg aga cgg tac tct gag gat gac tac ctc cag acc atc | 397 |
| Ser Asn Lys Thr Arg Arg Tyr Ser Glu Asp Asp Tyr Leu Gln Thr Ile | |
| 95 100 105 | |
| aca aac ata cag aga tgc cca tgg aac cgg caa gca gaa gaa tat gac | 445 |
| Thr Asn Ile Gln Arg Cys Pro Trp Asn Arg Gln Ala Glu Glu Tyr Asp | |
| 110 115 120 | |
| aat ttt aga gca aaa ctg gct tcc tgt tgc gat gcc att caa gac ttc | 493 |
| Asn Phe Arg Ala Lys Leu Ala Ser Cys Cys Asp Ala Ile Gln Asp Phe | |
| 125 130 135 | |
| gtg gtt tcc cag aac aac act cca gtg ggg act aac atg agc tac gag | 541 |
| Val Val Ser Gln Asn Asn Thr Pro Val Gly Thr Asn Met Ser Tyr Glu | |
| 140 145 150 155 | |
| gtg gaa agc aag aaa cac atc ccc att cga gag aac att ttc cac atg | 589 |
| Val Glu Ser Lys Lys His Ile Pro Ile Arg Glu Asn Ile Phe His Met | |
| 160 165 170 | |
| ttt cca gtg tcg cag cct ttt gtg gac tat ccc tat aac cag tgt gca | 637 |
| Phe Pro Val Ser Gln Pro Phe Val Asp Tyr Pro Tyr Asn Gln Cys Ala | |
| 175 180 185 | |
| gtg gtt ggt aat ggg gga att ctc aac aag tct ctc tgc gga gca gaa | 685 |
| Val Val Gly Asn Gly Gly Ile Leu Asn Lys Ser Leu Cys Gly Ala Glu | |
| 190 195 200 | |
| att gat aaa tct gac ttc gtc ttc agg tgt aac ctc ccc cca atc aca | 733 |
| Ile Asp Lys Ser Asp Phe Val Phe Arg Cys Asn Leu Pro Pro Ile Thr | |
| 205 210 215 | |
| ggg agc gct agt aaa gat gtt gga agc aaa aca aat ctt gtg act gtc | 781 |
| Gly Ser Ala Ser Lys Asp Val Gly Ser Lys Thr Asn Leu Val Thr Val | |
| 220 225 230 235 | |

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|---|------|
| aat ccc agc att ata acc ctg aag tac cag aat ttg aag gag aag aaa | 829 |
| Asn Pro Ser Ile Ile Thr Leu Lys Tyr Gln Asn Leu Lys Glu Lys Lys | |
| 240 245 250 | |
| gca cag ttt ttg gag gac atc tcc acc tat gga gat gca ttc ctc ctc | 877 |
| Ala Gln Phe Leu Glu Asp Ile Ser Thr Tyr Gly Asp Ala Phe Leu Leu | |
| 255 260 265 | |
| ctg cca gca ttt tcc tat cgg gcc aac aca ggc atc tct ttt aaa gtc | 925 |
| Leu Pro Ala Phe Ser Tyr Arg Ala Asn Thr Gly Ile Ser Phe Lys Val | |
| 270 275 280 | |
| tac caa aca ctc aaa gag tca aaa atg agg caa aag gtt ctc ttc ttc | 973 |
| Tyr Gln Thr Leu Lys Glu Ser Lys Met Arg Gln Lys Val Leu Phe Phe | |
| 285 290 295 | |
| cat ccc agg tac ctg aga cac ctc gct ctt ttc tgg aga act aaa ggg | 1021 |
| His Pro Arg Tyr Leu Arg His Leu Ala Leu Phe Trp Arg Thr Lys Gly | |
| 300 305 310 315 | |
| gtg act gca tac cgc ttg tcc aca ggc ttg atg att gca agt gtc gct | 1069 |
| Val Thr Ala Tyr Arg Leu Ser Thr Gly Leu Met Ile Ala Ser Val Ala | |
| 320 325 330 | |
| gtg gaa ctg tgt gaa aac gtg aag ctc tac gga ttc tgg cct ttc tct | 1117 |
| Val Glu Leu Cys Glu Asn Val Lys Leu Tyr Gly Phe Trp Pro Phe Ser | |
| 335 340 345 | |
| aag act atc gaa gac acc cca ctc agt cac cac tac tat gat aac atg | 1165 |
| Lys Thr Ile Glu Asp Thr Pro Leu Ser His His Tyr Tyr Asp Asn Met | |
| 350 355 360 | |
| tta cct aag cat ggt ttc cac cag atg cct aaa gaa tac agc caa atg | 1213 |
| Leu Pro Lys His Gly Phe His Gln Met Pro Lys Glu Tyr Ser Gln Met | |
| 365 370 375 | |

ctc cag ctc cat atg aga gga atc ctc aaa ctg caa ttc agc aaa tgt 1261
 Leu Gln Leu His Met Arg Gly Ile Leu Lys Leu Gln Phe Ser Lys Cys
 370 385 390 395
 gaa acg gct taa cgtttct tagaaggaga ataatttcag gaggtggagt 1310
 Glu Thr Ala
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 ggatgtgtca cagcatctcc aaaaagccaa tagaagaagg cacagagaaa gcatgaatta 1370
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Ala Arg Ile Leu Val Glu Glu Ser Arg Glu Ala Thr His Gly Thr Pro

35 40 45

Ala Ala Leu Arg Thr Leu Arg Ser Pro Ala Thr Ala Val Pro Arg Ala

50 55 60

Thr Asn Ser Thr Tyr Leu Asn Glu Lys Ser Leu Gln Leu Thr Glu Lys

65 70 75 80

Cys Lys Asn Leu Gln Tyr Gly Ile Glu Ser Phe Ser Asn Lys Thr Lys

85 90 95

Gly Tyr Ser Glu Asn Asp Tyr Leu Gln Ile Ile Thr Asp Ile Gln Ser
 100 105 110
 Cys Pro Trp Lys Arg Gln Ala Glu Glu Tyr Ala Asn Phe Arg Ala Lys
 115 120 125
 Leu Ala Ser Cys Cys Asp Ala Val Gln Asn Phe Val Val Ser Gln Asn
 130 135 140
 Asn Thr Pro Val Gly Thr Asn Met Ser Tyr Glu Val Glu Ser Lys Lys
 145 150 155 160
 Glu Ile Pro Ile Lys Lys Asn Ile Phe His Met Phe Pro Val Ser Gln
 165 170 175
 Pro Phe Val Asp Tyr Pro Tyr Asn Gln Cys Ala Val Val Gly Asn Gly
 180 185 190
 Gly Ile Leu Asn Lys Ser Leu Cys Gly Thr Glu Ile Asp Lys Ser Asp
 195 200 205
 Phe Val Phe Arg Cys Asn Leu Pro Pro Thr Thr Gly Asp Val Ser Lys
 210 215 220
 Asp Val Gly Ser Lys Thr Asn Leu Val Thr Ile Asn Pro Ser Ile Ile
 225 230 235 240
 Thr Leu Lys Tyr Gly Asn Leu Lys Glu Lys Lys Ala Leu Phe Leu Glu
 245 250 255
 Asp Ile Ala Thr Tyr Gly Asp Ala Phe Phe Phe Leu Pro Ala Phe Ser
 260 265 270
 Phe Arg Ala Asn Thr Gly Thr Ser Phe Lys Val Tyr Tyr Thr Leu Glu
 275 280 285
 Glu Ser Lys Ala Arg Gln Lys Val Leu Phe Phe His Pro Lys Tyr Leu
 290 295 300
 Lys Asp Leu Ala Leu Phe Trp Arg Thr Lys Gly Val Thr Ala Tyr Arg

305 310 315 320
 Leu Ser Thr Gly Leu Met Ile Thr Ser Val Ala Val Glu Leu Cys Lys

325 330 335
 Asn Val Lys Leu Tyr Gly Phe Trp Pro Phe Ser Lys Thr Val Glu Asp

340 345 350
 Ile Pro Val Ser His His Tyr Tyr Asp Asn Lys Leu Pro Lys His Gly

355 360 365
 Phe His Gln Met Pro Lys Glu Tyr Ser Gln Ile Leu Gln Leu His Met

370 375 380
 Lys Gly Ile Leu Lys Leu Gln Phe Ser Lys Cys Glu Val Ala

385 390 395

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atg cgg ccg ggg ggc gca ctg ctc gcc ctg ctc gcc agc ctg ctg ctg 139

Met Arg Pro Gly Gly Ala Leu Leu Ala Leu Leu Ala Ser Leu Leu Leu

1 5 10 15

ctg ctg ctg ctg cgc ctg ctc tgg tgc ccg gca gac gcg ccc ggc cgc 187

Leu Leu Leu Leu Arg Leu Leu Trp Cys Pro Ala Asp Ala Pro Gly Arg

20 25 30

gcc agg att ctg gtg gag gaa agc agg gag gcc acc cac ggc acc ccc 235

Ala Arg Ile Leu Val Glu Glu Ser Arg Glu Ala Thr His Gly Thr Pro

35 40 45

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|---|-----|
| gca gcg ctg agg acg ctc cgg agc ccg gcg acc gcg gta ccg cgc gcc | 283 |
| Ala Ala Leu Arg Thr Leu Arg Ser Pro Ala Thr Ala Val Pro Arg Ala | |
| 50 55 60 | |
| act aac agc aca tat ctg aat gag aag tcg ctc caa ctg acg gag aaa | 331 |
| Thr Asn Ser Thr Tyr Leu Asn Glu Lys Ser Leu Gln Leu Thr Glu Lys | |
| 65 70 75 80 | |
| tgc aaa aat ctg caa tat ggc att gag tct ttc tct aac aaa acg aaa | 379 |
| Cys Lys Asn Leu Gln Tyr Gly Ile Glu Ser Phe Ser Asn Lys Thr Lys | |
| 85 90 95 | |
| ggg tat tca gag aac gac tac ctt cag att atc aca gat ata cag agt | 427 |
| Gly Tyr Ser Glu Asn Asp Tyr Leu Gln Ile Ile Thr Asp Ile Gln Ser | |
| 100 105 110 | |
| tgt cca tgg aaa cgg caa gca gaa gaa tat gca aat ttt aga gcc aaa | 475 |
| Cys Pro Trp Lys Arg Gln Ala Glu Glu Tyr Ala Asn Phe Arg Ala Lys | |
| 115 120 125 | |
| ctt gct tcc tgc tgt gat gct gtt caa aac ttt gtt gtt tct cag aat | 523 |
| Leu Ala Ser Cys Cys Asp Ala Val Gln Asn Phe Val Val Ser Gln Asn | |
| 130 135 140 | |
| aac act cca gtt ggg act aat atg agt tac gag gtg gaa agc aaa aaa | 571 |
| Asn Thr Pro Val Gly Thr Asn Met Ser Tyr Glu Val Glu Ser Lys Lys | |
| 145 150 155 160 | |
| gaa atc cca att aag aag aac att ttt cat atg ttt cca gtg tcc cag | 619 |
| Glu Ile Pro Ile Lys Lys Asn Ile Phe His Met Phe Pro Val Ser Gln | |
| 165 170 175 | |
| cct ttt gtg gac tac cct tat aat cag tgt gca gtg gtc gga aat ggg | 667 |
| Pro Phe Val Asp Tyr Pro Tyr Asn Gln Cys Ala Val Val Gly Asn Gly | |
| 180 185 190 | |

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| gga att ctg aat aag tct ctc tgt gga act gaa ata gat aaa tcc gac | 715 |
| Gly Ile Leu Asn Lys Ser Leu Cys Gly Thr Glu Ile Asp Lys Ser Asp | |
| 195 200 205 | |
| ttc gtt ttt agg tgt aac cta ccc cca acc aca gga gat gtt agt aaa | 763 |
| Phe Val Phe Arg Cys Asn Leu Pro Pro Thr Thr Gly Asp Val Ser Lys | |
| 210 215 220 | |
| gat gtt ggc agt aaa aca aat ctt gtg act ata aat cca agc atc ata | 811 |
| Asp Val Gly Ser Lys Thr Asn Leu Val Thr Ile Asn Pro Ser Ile Ile | |
| 225 230 235 240 | |
| act ctg aaa tat ggg aac tta aag gaa aaa aaa gcc cta ttt ttg gag | 859 |
| Thr Leu Lys Tyr Gly Asn Leu Lys Glu Lys Lys Ala Leu Phe Leu Glu | |
| 245 250 255 | |
| gac att gca acc tat gga gat gca ttt ttt ttt ctg cca gca ttt tcc | 907 |
| Asp Ile Ala Thr Tyr Gly Asp Ala Phe Phe Phe Leu Pro Ala Phe Ser | |
| 260 265 270 | |
| ttc agg gcc aac acg ggt acc tct ttc aaa gta tac tac acg ctc gaa | 955 |
| Phe Arg Ala Asn Thr Gly Thr Ser Phe Lys Val Tyr Tyr Thr Leu Glu | |
| 275 280 285 | |
| gag tct aaa gca aga caa aag gtt cta ttt ttc cat ccc aag tac ctg | 1003 |
| Glu Ser Lys Ala Arg Gln Lys Val Leu Phe Phe His Pro Lys Tyr Leu | |
| 290 295 300 | |
| aaa gat ctg gcc ctt ttc tgg aga act aaa ggt gtg act gca tac cgc | 1051 |
| Lys Asp Leu Ala Leu Phe Trp Arg Thr Lys Gly Val Thr Ala Tyr Arg | |
| 305 310 315 320 | |
| ttg tcc acc ggc ttg atg atc aca agt gtt gca gtg gaa ctg tgt aaa | 1099 |
| Leu Ser Thr Gly Leu Met Ile Thr Ser Val Ala Val Glu Leu Cys Lys | |
| 325 330 335 | |

aat gtg aag ctg tat gga ttc tgg ccc ttc tct aaa act gta gaa gac 1147
 Asn Val Lys Leu Tyr Gly Phe Trp Pro Phe Ser Lys Thr Val Glu Asp

340 345 350

ata cct gtc agc cat cac tat tat gac aac aag cta cct aaa cat ggt 1195
 Ile Pro Val Ser His His Tyr Tyr Asp Asn Lys Leu Pro Lys His Gly

355 360 365

ttc cat cag atg ccc aaa gaa tac agc cag atc ctc caa ctt cac atg 1243
 Phe His Gln Met Pro Lys Glu Tyr Ser Gln Ile Leu Gln Leu His Met

370 375 380

aaa gga atc ctc aaa ctg caa ttt agc aaa tgt gaa gtc gcc taa 1288
 Lys Gly Ile Leu Lys Leu Gln Phe Ser Lys Cys Glu Val Ala

385 390 395

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ccaaacacca aaggaggtgg ctaaagagta ttttgagatg agccccaaaa tttggtttga 1408

ccaaagcttc ccactcatt ttgcaatgat ggcaagtcac tcaatccttc tcattcttcat 1468

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<213> Human

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Phe Ala Trp Gly Leu Leu Phe Leu Leu Ile Phe Ile Tyr Phe Thr Asp

20 25 30

Ser Asn Pro Ala Glu Pro Val Pro Ser Ser Leu Ser Phe Leu Glu Thr

35 40 45

Arg Arg Leu Leu Pro Val Gln Gly Lys Gln Arg Ala Ile Met Gly Ala

| | | |
|---|-----|-----|
| 50 | 55 | 60 |
| Ala His Glu Pro Ser Pro Pro Gly Gly Leu Asp Ala Arg Gln Ala Leu | | |
| 65 | 70 | 75 |
| Pro Arg Ala His Pro Ala Gly Ser Phe His Ala Gly Pro Gly Asp Leu | | 80 |
| | 85 | 90 |
| Gln Lys Trp Ala Gln Ser Gln Asp Gly Phe Glu His Lys Glu Phe Phe | | 95 |
| 100 | 105 | 110 |
| Ser Ser Gln Val Gly Arg Lys Ser Gln Ser Ala Phe Tyr Pro Glu Asp | | |
| 115 | 120 | 125 |
| Asp Asp Tyr Phe Phe Ala Ala Gly Gln Pro Gly Trp His Ser His Thr | | |
| 130 | 135 | 140 |
| Gln Gly Thr Leu Gly Phe Pro Ser Pro Gly Glu Pro Gly Pro Arg Glu | | |
| 145 | 150 | 155 |
| Gly Ala Phe Pro Ala Ala Gln Val Gln Arg Arg Arg Val Lys Lys Arg | | 160 |
| | 165 | 170 |
| His Arg Arg Gln Arg Arg Ser His Val Leu Glu Glu Gly Asp Asp Gly | | 175 |
| 180 | 185 | 190 |
| Asp Arg Leu Tyr Ser Ser Met Ser Arg Ala Phe Leu Tyr Arg Leu Trp | | |
| 195 | 200 | 205 |
| Lys Gly Asn Val Ser Ser Lys Met Leu Asn Pro Arg Leu Gln Lys Ala | | |
| 210 | 215 | 220 |
| Met Lys Asp Tyr Leu Thr Ala Asn Lys His Gly Val Arg Phe Arg Gly | | |
| 225 | 230 | 235 |
| Lys Arg Glu Ala Gly Leu Ser Arg Ala Gln Leu Leu Cys Gln Leu Arg | | 240 |
| | 245 | 250 |
| Ser Arg Ala Arg Val Arg Thr Leu Asp Gly Thr Glu Ala Pro Phe Ser | | 255 |
| 260 | 265 | 270 |

Ala Leu Gly Trp Arg Arg Leu Val Pro Ala Val Pro Leu Ser Gln Leu
 275 280 285
 His Pro Arg Gly Leu Arg Ser Cys Ala Val Val Met Ser Ala Gly Ala
 290 295 300
 Ile Leu Asn Ser Ser Leu Gly Glu Glu Ile Asp Ser His Asp Ala Val
 305 310 315 320
 Leu Arg Phe Asn Ser Ala Pro Thr Arg Gly Tyr Glu Lys Asp Val Gly
 325 330 335
 Asn Lys Thr Thr Ile Arg Ile Ile Asn Ser Gln Ile Leu Thr Asn Pro
 340 345 350
 Ser His His Phe Ile Asp Ser Ser Leu Tyr Lys Asp Val Ile Leu Val
 355 360 365
 Ala Trp Asp Pro Ala Pro Tyr Ser Ala Asn Leu Asn Leu Trp Tyr Lys
 370 375 380
 Lys Pro Asp Tyr Asn Leu Phe Thr Pro Tyr Ile Gln His Arg Gln Arg
 385 390 395 400
 Asn Pro Asn Gln Pro Phe Tyr Ile Leu His Pro Lys Phe Ile Trp Gln
 405 410 415
 Leu Trp Asp Ile Ile Gln Glu Asn Thr Lys Glu Lys Ile Gln Pro Asn
 420 425 430
 Pro Pro Ser Ser Gly Phe Ile Gly Ile Leu Ile Met Met Ser Met Cys
 435 440 445
 Arg Glu Val His Val Tyr Glu Tyr Ile Pro Ser Val Arg Gln Thr Glu
 450 455 460
 Leu Cys His Tyr His Glu Leu Tyr Tyr Asp Ala Ala Cys Thr Leu Gly
 465 470 475 480
 Ala Tyr His Pro Leu Leu Tyr Glu Lys Leu Leu Val Gln Arg Leu Asn

| | | | |
|---|-----|-----|-----|
| | 485 | 490 | 495 |
| Met Gly Thr Gln Gly Asp Leu His Arg Lys Gly Lys Val Val Leu Pro | | | |
| | 500 | 505 | 510 |
| Gly Phe Gln Ala Val His Cys Pro Ala Pro Ser Pro Val Ile Pro His | | | |
| | 515 | 520 | 525 |
| Ser | | | |

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atg aaa cca cac ttg aag caa tgg aga caa cga atg ctt ttc gga ata 223
Met Lys Pro His Leu Lys Gln Trp Arg Gln Arg Met Leu Phe Gly Ile
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Phe Ala Trp Gly Leu Leu Phe Leu Leu Ile Phe Ile Tyr Phe Thr Asp
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agc aac ccc gct gag cct gta ccc agc tcc ctc tcc ttc ctg gag acc 319
Ser Asn Pro Ala Glu Pro Val Pro Ser Ser Leu Ser Phe Leu Glu Thr
          35           40           45
agg agg ctc ctg ccg gtg cag ggg aag cag cgg gcc atc atg ggc gcc 367
Arg Arg Leu Leu Pro Val Gln Gly Lys Gln Arg Ala Ile Met Gly Ala
          50           55           60
gca cat gag ccc tcc ccg cct ggg ggc ctg gac gca cgc cag gcg ctg 415
Ala His Glu Pro Ser Pro Pro Gly Gly Leu Asp Ala Arg Gln Ala Leu
  
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| | | | | |
|---|-----|-----|-----|--|
| 65 | 70 | 75 | 80 | |
| ccc cgc gcc cac cca gcc ggt tcc ttt cat gcg ggg cct gga gac ctg | 463 | | | |
| Pro Arg Ala His Pro Ala Gly Ser Phe His Ala Gly Pro Gly Asp Leu | | | | |
| 85 | 90 | 95 | | |
| cag aaa tgg gcc cag tcc caa gat ggg ttt gaa cat aaa gag ttt ttt | 511 | | | |
| Gln Lys Trp Ala Gln Ser Gln Asp Gly Phe Glu His Lys Glu Phe Phe | | | | |
| 100 | 105 | 110 | | |
| tca tcc cag gtg ggg aga aaa tct caa agt gct ttc tac ccg gag gat | 559 | | | |
| Ser Ser Gln Val Gly Arg Lys Ser Gln Ser Ala Phe Tyr Pro Glu Asp | | | | |
| 115 | 120 | 125 | | |
| gac gac tac ttt ttt gct gct ggt cag cca ggg tgg cac agc cac act | 607 | | | |
| Asp Asp Tyr Phe Phe Ala Ala Gly Gln Pro Gly Trp His Ser His Thr | | | | |
| 130 | 135 | 140 | | |
| cag ggg aca ttg gga ttc cct tcc ccc ggg gag cca ggc cca cgg gag | 655 | | | |
| Gln Gly Thr Leu Gly Phe Pro Ser Pro Gly Glu Pro Gly Pro Arg Glu | | | | |
| 145 | 150 | 155 | 160 | |
| ggg gct ttt ccg gct gca cag gtc cag agg agg cgg gtg aag aag agg | 703 | | | |
| Gly Ala Phe Pro Ala Ala Gln Val Gln Arg Arg Arg Val Lys Lys Arg | | | | |
| 165 | 170 | 175 | | |
| cac cgg agg cag aga agg agc cac gtg ttg gag gag ggc gac gac ggc | 751 | | | |
| His Arg Arg Gln Arg Arg Ser His Val Leu Glu Glu Gly Asp Asp Gly | | | | |
| 180 | 185 | 190 | | |
| gac agg ctg tac tcc tcc atg tcc agg gcc ttc ctg tac cgg ctc tgg | 799 | | | |
| Asp Arg Leu Tyr Ser Ser Met Ser Arg Ala Phe Leu Tyr Arg Leu Trp | | | | |
| 195 | 200 | 205 | | |
| aag ggg aac gtc tct tcc aaa atg ctg aac ccg cgc ctg cag aag gcg | 847 | | | |
| Lys Gly Asn Val Ser Ser Lys Met Leu Asn Pro Arg Leu Gln Lys Ala | | | | |

| | | | |
|---|------|-----|-----|
| 210 | 215 | 220 | |
| atg aag gat tac ctg acc gcc aac aag cac ggg gtg cgc ttc cgc ggg | 895 | | |
| Met Lys Asp Tyr Leu Thr Ala Asn Lys His Gly Val Arg Phe Arg Gly | | | |
| 225 | 230 | 235 | 240 |
| aag cgg gag gcc ggg ctg agc agg gca cag ctg ctg tgc cag ctg cgg | 943 | | |
| Lys Arg Glu Ala Gly Leu Ser Arg Ala Gln Leu Leu Cys Gln Leu Arg | | | |
| 245 | 250 | 255 | |
| agc cgc gcg cgc gtg cgg acg ctg gac gcc acc gag gcg ccc ttt tct | 991 | | |
| Ser Arg Ala Arg Val Arg Thr Leu Asp Gly Thr Glu Ala Pro Phe Ser | | | |
| 260 | 265 | 270 | |
| gcg ctg ggc tgg cgg cgc ctg gtg ccc gcc gtg ccc ctg agc cag ctg | 1039 | | |
| Ala Leu Gly Trp Arg Arg Leu Val Pro Ala Val Pro Leu Ser Gln Leu | | | |
| 275 | 280 | 285 | |
| cac ccc cgc gcc ctg cgc agc tgc gct gtc gtc atg tct gca gcc gca | 1087 | | |
| His Pro Arg Gly Leu Arg Ser Cys Ala Val Val Met Ser Ala Gly Ala | | | |
| 290 | 295 | 300 | |
| atc ctc aac tct tcc ttg ggc gag gaa ata gat tct cat gat gcg gtt | 1135 | | |
| Ile Leu Asn Ser Ser Leu Gly Glu Glu Ile Asp Ser His Asp Ala Val | | | |
| 305 | 310 | 315 | 320 |
| ttg aga ttt aac tct gct cct aca cgt ggt tat gag aaa gat gtt ggg | 1183 | | |
| Leu Arg Phe Asn Ser Ala Pro Thr Arg Gly Tyr Glu Lys Asp Val Gly | | | |
| 325 | 330 | 335 | |
| aat aaa acc acc ata cgc atc att aat tcg cag att ctg acc aac ccc | 1231 | | |
| Asn Lys Thr Thr Ile Arg Ile Ile Asn Ser Gln Ile Leu Thr Asn Pro | | | |
| 340 | 345 | 350 | |
| agc cat cac ttc att gac agt tca ctg tat aaa gac gtc att ttg gtg | 1279 | | |
| Ser His His Phe Ile Asp Ser Ser Leu Tyr Lys Asp Val Ile Leu Val | | | |

| | | | |
|--|-----|-----|-----|
| 355 | 360 | 365 | |
| gcc tgg gac cct gcc cca tat tcc gca aat ctt aac ctg tgg tac aaa 1327 | | | |
| Ala Trp Asp Pro Ala Pro Tyr Ser Ala Asn Leu Asn Leu Trp Tyr Lys | | | |
| 370 | 375 | 380 | |
| aaa ccg gat tac aac ctg ttc act cca tat att cag cat cgt cag aga 1375 | | | |
| Lys Pro Asp Tyr Asn Leu Phe Thr Pro Tyr Ile Gln His Arg Gln Arg | | | |
| 385 | 390 | 395 | 400 |
| aac cca aat cag cca ttt tac att ctt cat cct aaa ttt ata tgg cag 1423 | | | |
| Asn Pro Asn Gln Pro Phe Tyr Ile Leu His Pro Lys Phe Ile Trp Gln | | | |
| 405 | 410 | 415 | |
| ctc tgg gat att atc cag gag aac act aaa gag aag att caa cca aac 1471 | | | |
| Leu Trp Asp Ile Ile Gln Glu Asn Thr Lys Glu Lys Ile Gln Pro Asn | | | |
| 420 | 425 | 430 | |
| cca cca tct tct ggt ttc att gga atc ctc atc atg atg tcc atg tgc 1519 | | | |
| Pro Pro Ser Ser Gly Phe Ile Gly Ile Leu Ile Met Met Ser Met Cys | | | |
| 435 | 440 | 445 | |
| aga gag gtg cac gtg tat gaa tat atc cca tcc gtg cgg cag acg gag 1567 | | | |
| Arg Glu Val His Val Tyr Glu Tyr Ile Pro Ser Val Arg Gln Thr Glu | | | |
| 450 | 455 | 460 | |
| ctg tgc cac tac cac gag ctg tac tac gac gca gcc tgc acc ctc ggg 1615 | | | |
| Leu Cys His Tyr His Glu Leu Tyr Tyr Asp Ala Ala Cys Thr Leu Gly | | | |
| 465 | 470 | 475 | 480 |
| gcg tac cac cca cta ctc tat gag aag ctc ctg gtg cag cgc ctg aac 1663 | | | |
| Ala Tyr His Pro Leu Leu Tyr Glu Lys Leu Leu Val Gln Arg Leu Asn | | | |
| 485 | 490 | 495 | |
| atg ggc acg cag ggg gat ttg cat cgc aag ggc aag gtg gtt ctt cct 1711 | | | |
| Met Gly Thr Gln Gly Asp Leu His Arg Lys Gly Lys Val Val Leu Pro | | | |

| | | | |
|--|-----|-----|------|
| 500 | 505 | 510 | |
| ggc ttc cag gcg gtg cac tgc cct gca cca agt cca gtc att cca cac 1759 | | | |
| Gly Phe Gln Ala Val His Cys Pro Ala Pro Ser Pro Val Ile Pro His | | | |
| 515 | 520 | 525 | |
| tct taaaaagggtttcttggaatcaatgtgcaatgtaca | | | |
| | | | 1800 |
| Ser | | | |
| <210> 7 | | | |
| <211> 524 | | | |
| <212> PRT | | | |
| <213> Mouse | | | |
| <400> 7 | | | |
| Met Lys Pro His Leu Lys Gln Trp Arg Gln Arg Met Leu Phe Gly Ile | | | |
| 1 | 5 | 10 | 15 |
| Phe Val Trp Gly Leu Leu Phe Leu Ala Ile Phe Ile Tyr Phe Thr Asn | | | |
| 20 | 25 | 30 | |
| Ser Asn Pro Ala Ala Pro Met Pro Ser Ser Phe Ser Phe Leu Glu Ser | | | |
| 35 | 40 | 45 | |
| Arg Gly Leu Leu Pro Leu Gln Gly Lys Gln Arg Val Ile Met Gly Ala | | | |
| 50 | 55 | 60 | |
| Leu Gln Glu Pro Ser Leu Pro Arg Ser Leu Asp Ala Ser Lys Val Leu | | | |
| 65 | 70 | 75 | 80 |
| Leu Asp Ser His Pro Glu Asn Pro Phe His Pro Trp Pro Gly Asp Pro | | | |
| 85 | 90 | 95 | |
| Gln Lys Trp Asp Gln Ala Pro Asn Gly Phe Asp Asn Gly Asp Glu Phe | | | |
| 100 | 105 | 110 | |
| Phe Thr Ser Gln Val Gly Arg Lys Ser Gln Ser Ala Phe Tyr Pro Glu | | | |
| 115 | 120 | 125 | |
| Glu Asp Ser Tyr Phe Phe Val Ala Asp Gln Pro Glu Leu Tyr His His | | | |

| | | |
|--|-----|-----|
| 130 | 135 | 140 |
| Arg Gln Gly Ala Leu Glu Leu Pro Ser Pro Gly Glu Thr Ser Trp Arg | | |
| 145 | 150 | 155 |
| Ser Gly Pro Val Gln Pro Lys Gln Lys Leu Leu His Pro Arg Arg Gly | | 160 |
| | 165 | 170 |
| Ser Leu Pro Glu Glu Ala Tyr Asp Ser Asp Met Leu Ser Ala Ser Met | | 175 |
| | 180 | 185 |
| Ser Arg Ala Phe Leu Tyr Arg Leu Trp Lys Gly Ala Val Ser Ser Lys | | 190 |
| | 195 | 200 |
| Met Leu Asn Pro Arg Leu Gln Lys Ala Met Arg Tyr Tyr Met Ser Phe | | 205 |
| | 210 | 215 |
| Asn Lys His Gly Val Arg Phe Arg Arg Arg Gly Arg Arg Glu Ala Thr | | 220 |
| 225 | 230 | 235 |
| Arg Thr Gly Pro Glu Leu Leu Cys Glu Met Arg Arg Arg Val Arg Val | | 240 |
| | 245 | 250 |
| Arg Thr Leu Asp Gly Arg Glu Ala Pro Phe Ser Gly Leu Gly Trp Arg | | 255 |
| | 260 | 265 |
| Pro Leu Val Pro Gly Val Pro Leu Ser Gln Leu His Pro Arg Gly Leu | | 270 |
| | 275 | 280 |
| Ser Ser Cys Ala Val Val Met Ser Ala Gly Ala Ile Leu Asn Ser Ser | | 285 |
| | 290 | 295 |
| Leu Gly Glu Glu Ile Asp Ser His Asp Ala Val Leu Arg Phe Asn Ser | | 300 |
| 305 | 310 | 315 |
| Ala Pro Thr Arg Gly Tyr Glu Lys Asp Val Gly Asn Lys Thr Thr Val | | 320 |
| | 325 | 330 |
| Arg Ile Ile Asn Ser Gln Ile Leu Ala Asn Pro Ser His His Phe Ile | | 335 |
| | 340 | 345 |
| | | 350 |

| | | | |
|---|-----|-----|-----|
| Asp Ser Ala Leu Tyr Lys Asp Val Ile Leu Val Ala Trp Asp Pro Ala | | | |
| 355 | 360 | 365 | |
| Pro Tyr Ser Ala Asn Leu Asn Leu Trp Tyr Lys Lys Pro Asp Tyr Asn | | | |
| 370 | 375 | 380 | |
| Leu Phe Thr Pro Tyr Ile Gln His Arg Arg Lys Tyr Pro Thr Gln Pro | | | |
| 385 | 390 | 395 | 400 |
| Phe Tyr Ile Leu His Pro Lys Phe Ile Trp Gln Leu Trp Asp Ile Ile | | | |
| 405 | 410 | 415 | |
| Gln Glu Asn Thr Arg Glu Lys Ile Gln Pro Asn Pro Pro Ser Ser Gly | | | |
| 420 | 425 | 430 | |
| Phe Ile Gly Ile Leu Ile Met Met Ser Met Cys Lys Glu Val His Val | | | |
| 435 | 440 | 445 | |
| Tyr Glu Tyr Ile Pro Ser Val Arg Gln Thr Glu Leu Cys His Tyr His | | | |
| 450 | 455 | 460 | |
| Glu Leu Tyr Tyr Asp Ala Ala Cys Thr Leu Gly Ala Tyr His Pro Leu | | | |
| 465 | 470 | 475 | 480 |
| Leu Tyr Glu Lys Leu Leu Val Gln Arg Leu Asn Thr Gly Thr Gln Ala | | | |
| 485 | 490 | 495 | |
| Asp Leu His His Lys Gly Lys Val Val Leu Pro Gly Phe Gln Thr Leu | | | |
| 500 | 505 | 510 | |
| Arg Cys Pro Val Thr Ser Pro Asn Asn Thr His Ser | | | |
| 515 | 520 | | |

<210> 8
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 <400> 8

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| ca atg aaa cca cac ttg aag caa tgg cga caa cga atg ctc ttt gga ata | 50 |
| Met Lys Pro His Leu Lys Gln Trp Arg Gln Arg Met Leu Phe Gly Ile | |
| 1 5 10 15 | |
| ttt gtt tgg ggg ctc ctc ttt ttg gca att ttc atc tac ttc acc aac | 98 |
| Phe Val Trp Gly Leu Leu Phe Leu Ala Ile Phe Ile Tyr Phe Thr Asn | |
| 20 25 30 | |
| agc aat cct gcg gca cct atg ccc agc tcc ttt tcc ttc ctg gag agc | 146 |
| Ser Asn Pro Ala Ala Pro Met Pro Ser Ser Phe Ser Phe Leu Glu Ser | |
| 35 40 45 | |
| cgt ggg ctc ctg cct cta cag ggc aag cag cgg gtc atc atg ggc gct | 194 |
| Arg Gly Leu Leu Pro Leu Gln Gly Lys Gln Arg Val Ile Met Gly Ala | |
| 50 55 60 | |
| ttg cag gaa ccc tct ttg ccc aga agt ttg gat gca agc aaa gtg ctt | 242 |
| Leu Gln Glu Pro Ser Leu Pro Arg Ser Leu Asp Ala Ser Lys Val Leu | |
| 65 70 75 80 | |
| ctg gac agc cac cct gag aac cct ttc cac cct tgg cct ggg gac cca | 290 |
| Leu Asp Ser His Pro Glu Asn Pro Phe His Pro Trp Pro Gly Asp Pro | |
| 85 90 95 | |
| cag aaa tgg gat cag gcc cca aat ggc ttt gac aat ggg gat gag ttt | 338 |
| Gln Lys Trp Asp Gln Ala Pro Asn Gly Phe Asp Asn Gly Asp Glu Phe | |
| 100 105 110 | |
| ttt aca tcc cag gtt ggg agg aaa tca caa agc gct ttc tat ccc gag | 386 |
| Phe Thr Ser Gln Val Gly Arg Lys Ser Gln Ser Ala Phe Tyr Pro Glu | |
| 115 120 125 | |
| gaa gat agc tat ttt ttt gtt gcg gat cag cct gag ttg tac cac cac | 434 |
| Glu Asp Ser Tyr Phe Phe Val Ala Asp Gln Pro Glu Leu Tyr His His | |
| 130 135 140 | |

agg cag ggt gca ctg gag ctg cca tct cca ggg gag aca tca tgg cga 482
 Arg Gln Gly Ala Leu Glu Leu Pro Ser Pro Gly Glu Thr Ser Trp Arg
 145 150 155 160
 tca gga cct gtt cag ccc aag cag aag ctg ctt cac cca agg cga ggc 530
 Ser Gly Pro Val Gln Pro Lys Gln Lys Leu Leu His Pro Arg Arg Gly
 165 170 175
 agc ttg cct gag gaa gcc tat gac agc gac atg ctg tca gcc tcc atg 578
 Ser Leu Pro Glu Glu Ala Tyr Asp Ser Asp Met Leu Ser Ala Ser Met
 180 185 190
 tcg aga gcc ttc ctg tac cgg ctc tgg aag ggg gcc gtg tcc tct aag 626
 Ser Arg Ala Phe Leu Tyr Arg Leu Trp Lys Gly Ala Val Ser Ser Lys
 195 200 205
 atg ttg aac ccg cgc ctg cag aag gcc atg cgt tac tac atg tcc ttc 674
 Met Leu Asn Pro Arg Leu Gln Lys Ala Met Arg Tyr Tyr Met Ser Phe
 210 215 220
 aac aag cat ggt gtg cgc ttc cgc agg cgg ggt cgg cgt gaa gct aca 722
 Asn Lys His Gly Val Arg Phe Arg Arg Arg Gly Arg Arg Glu Ala Thr
 225 230 235 240
 cgt aca ggg ccg gag ctg ctg tgt gag atg cgc aga cgt gtg cgt gtg 770
 Arg Thr Gly Pro Glu Leu Leu Cys Glu Met Arg Arg Arg Val Arg Val
 245 250 255
 cgc acg ttg gac ggc aga gag gcg ccc ttc tcg ggg ctg ggc tgg cgg 818
 Arg Thr Leu Asp Gly Arg Glu Ala Pro Phe Ser Gly Leu Gly Trp Arg
 260 265 270
 cct ctg gta cca ggt gta cct ctg agc cag ttg cac ccg cgc ggt ctg 866
 Pro Leu Val Pro Gly Val Pro Leu Ser Gln Leu His Pro Arg Gly Leu
 275 280 285

agc agc tgc gca gtt gtc atg tct gcc ggt gcc atc ctg aac tcc tcc 914
 Ser Ser Cys Ala Val Val Met Ser Ala Gly Ala Ile Leu Asn Ser Ser
 290 295 300
 ttg ggg gag gaa atc gat tct cat gat gca gtt ttg aga ttt aac tct 962
 Leu Gly Glu Glu Ile Asp Ser His Asp Ala Val Leu Arg Phe Asn Ser
 305 310 315 320
 gcc cct acc cgt ggc tac gag aaa gat gtc gga aat aaa acc aca gta 1010
 Ala Pro Thr Arg Gly Tyr Glu Lys Asp Val Gly Asn Lys Thr Thr Val
 325 330 335
 cgc atc att aat tct cag att ctg gcc aac ccc agc cat cac ttc att 1058
 Arg Ile Ile Asn Ser Gln Ile Leu Ala Asn Pro Ser His His Phe Ile
 340 345 350
 gac agt gct tta tat aaa gat gtt atc ctg gta gcc tgg gat cct gct 1106
 Asp Ser Ala Leu Tyr Lys Asp Val Ile Leu Val Ala Trp Asp Pro Ala
 355 360 365
 cct tat tct gcc aat ctt aac ctg tgg tat aag aag cca gat tac aac 1154
 Pro Tyr Ser Ala Asn Leu Asn Leu Trp Tyr Lys Lys Pro Asp Tyr Asn
 370 375 380
 ctt ttc act cca tat atc cag cat cgc cgg aaa tac ccg act cag cca 1202
 Leu Phe Thr Pro Tyr Ile Gln His Arg Arg Lys Tyr Pro Thr Gln Pro
 385 390 395 400
 ttt tac att ctt cac ccc aag ttc ata tgg cag ctt tgg gac att atc 1250
 Phe Tyr Ile Leu His Pro Lys Phe Ile Trp Gln Leu Trp Asp Ile Ile
 405 410 415
 cag gag aat aca agg gag aag ata cag ccc aac cca cca tct tct ggt 1298
 Gln Glu Asn Thr Arg Glu Lys Ile Gln Pro Asn Pro Pro Ser Ser Gly
 420 425 430

ttt att gga atc ctc atc atg atg tcc atg tgt aaa gag gtg cac gtg 1346
 Phe Ile Gly Ile Leu Ile Met Met Ser Met Cys Lys Glu Val His Val
 435 440 445
 tat gag tac atc cca tct gtt cga cag aca gag ctt tgc cac tac cat 1394
 Tyr Glu Tyr Ile Pro Ser Val Arg Gln Thr Glu Leu Cys His Tyr His
 450 455 460
 gag ctg tac tac gac gca gcc tgc acc ttg ggg gcc tac cac cca ctg 1442
 Glu Leu Tyr Tyr Asp Ala Ala Cys Thr Leu Gly Ala Tyr His Pro Leu
 465 470 475 480
 ctc tat gaa aag cta ctg gtg cag cgc ctt aac aca ggc acc cag gca 1490
 Leu Tyr Glu Lys Leu Leu Val Gln Arg Leu Asn Thr Gly Thr Gln Ala
 485 490 495
 gac ttg cat cac aag ggc aag gta gtc ttg cca ggc ttc cag acc ctt 1538
 Asp Leu His His Lys Gly Lys Val Val Leu Pro Gly Phe Gln Thr Leu
 500 505 510
 cgg tgt cca gta acc agc ccc aac aat aca cat tct taa 1577
 Arg Cys Pro Val Thr Ser Pro Asn Asn Thr His Ser
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 aatggaactc ttgggaactg atgtgcaata aggt 1611

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 <212> DNA
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 <220>
 <223> Description of Artificial Sequence: Synthetic DNA
 <400> 9
 cttttctgga gaactaaagg 20

<210> 10

<211> 20
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<220>
<223> Description of Artificial Sequence: Synthetic DNA
<400> 10
aattgcagtt tgaggattcc 20

<210> 11
<211> 20
<212> DNA
<213> Artificial Sequence
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<223> Description of Artificial Sequence: Synthetic DNA
<400> 11
tggctcagga tgagatcggg 20

<210> 12
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<212> DNA
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<210> 15

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<213> Artificial Sequence

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caattgacat atctgaatga gaagtcgctc 30

<210> 16

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<213> Artificial Sequence

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<400> 16

tactaacatc tcctgtgggt gg 22

<210> 17

<211> 20

<212> DNA

<213> Artificial Sequence

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<400> 17

ccagtgtccc agccttttgt 20

<210> 18

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tgagtgggga agctttggtc 20

<210> 19
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<400> 19

gacaatgggg atgagttttt tacatcccag 30

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cgatttcctc cccaaggag gagttcagg 29

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<210> 24
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<400> 24
cgcaacaaaa aaatagctat cttcctcggg 30

<210> 25
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21